tréal, xviii. 40 (1931)). Calcicolous waters; rare stations in Essex, Middlesex and Berkshire Counties and in the Connecticut Valley.

Var. **Planchonii** (Casp.) Victorin in Contrib. Lab. Bot. Univ. Montréal, xviii. 40 (1931). East Andover in Essex County and Wakefield in Middlesex.

A. occidentalis (Pursh) Victorin in Contrib. Lab. Bot. Univ. Montréal, xviii. 40 (1931). (*Elodea canadensis* of Manual in part). Pond and river margins; occasional in the East on the mainland (except eastern Barnstable County) and sometimes becoming a nuisance, also Brookfield in Worcester County and occasional in Hampshire and Hampden Counties.

A. DENSA (Planch.) Victorin in Contrib. Lab. Bot. Univ. Montréal, xviii. 41 (1931). Established in Abington, Plymouth County (Knowlton in RHODORA, xlii. 524 (1940)).

VALLISNERIA L. TAPE GRASS. EEL GRASS.

V. americana Michx. (*V. spiralis* of Manual, not L.; cf. RHODORA, xx. 108 (1918)). Shallow fresh water; frequent.

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LILIUM SUPERBUM AND L. MICHIGANENSE

EDWIN D. HULL

In 1915 Farwell[1] described a new species of *Lilium*, which he called *L. michiganense*, including a typical form and two varieties, *L. m. umbelliferum* and *L. m. uniflorum*. Heretofore these plants had been considered as *L. superbum* L. Farwell's species appears to have been accepted by many botanists. Deam[2] considers it to be the usual form in Indiana, *L. superbum* being very rare in

[1] Notes on Michigan Liliaceae. Bull. Torr. Bot. Club **42**: 351–358.
[2] Flora of Indiana: 313, 314. 1940.

that state. L. H. Bailey, accepting it as valid, includes it in his Hortus Second, and gives its distribution as from Michigan to Minnesota and Missouri. However, the plants are still *L. superbum* to conservative botanists, and, after a study of them as they occur in the dune country of northern Indiana, where they are fairly common, and after comparing these specimens with typical *L. superbum* from the Atlantic Coastal Plain, I am convinced that the conservative viewpoint is the correct one. They should not be separated from *L. superbum*, which, like many others, seems to be a variable species, the variations depending partly on known causes, especially those of environment, and partly on causes that are obscure.

The habitats in which the Indiana plants were studied are three. In the northern portion of East Gary, Lake Co., there is a large wet prairie traversed by the Little Calumet River. This stream has been straightened, and the land made drier, by digging of the Burns Ditch. This area is practically treeless, and the lilies are exposed to full sun throughout the day, except for whatever shade is afforded by neighboring plants, for the most part coarse grasses, with a sprinkling of phlox and other prairie forms. A second habitat is on the eastern edge of this area, an oak woods with an undergrowth of crabapple and hazel. Through this woods a small swift stream, Willow Creek, has cut a rather deep canyon, and the area has become as dry as if a ditch had been dug. *Lilium* occurs here to some extent, but the plants are small, and, though I have observed them for many years, they have never flowered, although vegetative reproduction takes place. The third habitat is a piece of low, wet woods adjacent to a large swamp in the eastern part of the Indiana Dunes State Park at Tremont, Porter Co. Here, although heavily shaded, *Lilium* flowers as well as it does in the open prairie. In this park the plants were studied as well as could be without injury to them.

Bulbs. Indiana Dunes specimens are somewhat variable, in general globose, in one specimen distinctly subglobose. Coastal Plain specimens did not differ materially.

Height. Eleven specimens from Indiana Dunes showed a range from 6.7–12.6 dm., average 9.7 dm. The drying out of the swamp referred to has undoubtedly been a factor in the short

height. Years ago the tallest plants were much higher. The number of flowers may have nothing to do with height. A 1-flowered specimen may be taller than a 2-flowered plant; on the other hand the plants with the largest number of flowers were the tallest. Height of 15 Coastal Plain specimens 4.9–15.8 dm., average 9.7 dm., the average being the same in plants from both areas. The shortest plant, along with others, occurred at the "edge of tidal meadows, where nearly fresh except at very high tide" (CONNECTICUT, Greenwich, Sept. 7, 1927, *E. H. Eames, 10409*). In spite of its brief stature this plant bore five flowers. Height in *L. michiganense* 1–2 m. according to Farwell.

LEAF-ARRANGEMENT. Indiana plants have in general the first leaves put out solitary, then arranged in whorls until the inflorescence is approached, where solitary leaves are almost certain to occur in flowering specimens, either all leaves solitary, or mingled with perfect whorls. Or the leaves may occur in imperfect whorls, that is, 2–3 leaves arranged at one side of the stem, not entirely surrounding it. A single specimen at Tremont had all the leaves solitary except two at one side at the very top, a situation about like that in two Coastal Plain plants (CONNECTICUT, Voluntown, Aug. 6, 1920, *C. B. Graves & R. W. Woodward;* NEW JERSEY, Hoboken, July 27, 1854, *A. C. Hexamer & F. W. Maier*). Non-flowering plants usually have the uppermost leaves in perfect whorls. Very rarely a solitary leaf may occur among the whorls in the middle portion of the stem. There is not the slightest difference in leaf-arrangement between Indiana Dunes and Coastal Plain specimens.

NUMBER OF LEAVES TO A WHORL. In Indiana Dunes plants 10 specimens of perfect whorls varied from 3–13, average about 8. Forty specimens from the Coastal Plain varied from 4–18, average about 7.

LEAF-FORM. Indiana Dunes specimens varied from linear-lanceolate to oblong-lanceolate, with the linear type the more common. Environment has much to do with leaf-form, as leaves are widest in wooded areas, a typical leaf from the dry woods referred to in the notes on habitats being 8 cm. long by 2 cm. wide. Coastal Plain specimens showed the same variations, with, however, the oblong type being somewhat more frequent. Two of the eastern specimens had very broad leaves (WEST

VIRGINIA, Blue Ridge, Rockbridge Co., Aug., 1880, *W. H. Seaman;* NORTH CAROLINA, Blowing Rock, North Carolina Mts., Aug. 8, 1893, *B. L. Robinson, 124*). While the labels did not state, both of these plants were probably from wooded areas. All leaves, whether from east or west, are long-attenuate at both ends, except the basal portion of the leaves subtending the inflorescence, where they are short-attenuate, a character which seems unimportant, since it is common to many species to have the leaves immediately below the inflorescence modified. Long-attenuate leaves constitute one of the few characters which do not vary.

SURFACES OF LEAVES. All leaves, whether from eastern or western forms, were smooth above. Indiana Dunes specimens had the lower surface of all leaves roughened with scale-like hairs, except that leaves from woods were rough on margin only. Of 47 Coastal Plain leaves 19 were entirely smooth, 10 were roughened on margins only, while 18 were roughened on the principal veins also. A few had some of the leaves roughened while the others were smooth in the same plant. (Illustration: VIRGINIA, James City Co., July 23, 1939, *R. W. Menzel, 183*). Deam found "*Lilium superbum*" with smooth leaves "always on wooded slopes". A Coastal Plain specimen from "dry, sandy soil" had the lower surface roughened (NEW JERSEY, New Lisbon, Burlington Co., Oct. 13, 1899, *Alexander MacElwee,* 1570). In Ohio, between Indiana Dunes and the Coastal Plain, of two specimens one was smooth throughout (Nelson Twp., Portage Co., July 23, 1922, *Roscoe J. Webb*, bank of stream), while the other was roughened on the margins (Braceville, Trumbull Co., July 24, 1904, *A. N. Rood, 768*). Farwell states that some of the leaves of *L. michiganense* are smooth, which he calls a transition to *L. superbum*. Pubescence seems to be largely a matter of habitat.

NERVATION. In Indiana Dunes plants the number of conspicuous nerves varies from 3–6, with 3 much the most common. In Coastal Plain plants conspicuous nerves varied from 3–7, with 3 much the most common. Farwell says of *L. michiganense* 3–7-nerved. The width of the leaf has something to do with the number of nerves.

FLOWER-NUMBERS. From the Indiana Dunes 11 plants varied

from 1–10 in number of flowers, average about 5. From the Coastal Plain 43 plants varied from 1–12, average about 4. The amount of available water in the soil is undoubtedly a factor in flower production, according to Deam and my own observations. Deam says that *L. michiganense* in the driest soil produces but one flower. I have before noted in this paper that the plants never flower in the dry oak woods, the dry character of which is indicated by the undergrowth of crabapple and hazel. Specimens planted in my garden had in 1938 4 flowers, then became depauperate because grape vines took too much water from the soil, and in 1939 had but one flower, these plants then corresponding exactly to the description of *L. m. uniflorum* in Farwell's article. Planted in a better environment they were still 1-flowered in 1940, but in 1941 produced 4 flowers again. *L. m. uniflorum* does not seem to be a good variety, as flower-production depends largely on environment, also, of course, on the age of the plant. *L. m. uniflorum* is either a juvenile or depauperate form. What is true of this variety may also be true of *L. m. umbelliferum;* it may not have attained its full maturity, or it may be a once robust plant become somewhat depauperate.

FLOWER-ARRANGEMENT. The flowers of typical *L. michiganense* are arranged in a pyramidal cluster according to Farwell, but strictly in umbels according to Deam. Deam's description corresponds with that of *L. m. umbelliferum* of Farwell. *L. m. uniflorum,* of course, bears but a single flower. In *L. superbum* the flowers are produced in umbels or pyramidal racemes according to Deam, and in a pyramidal raceme according to Gray.[1] My own observations, on both Indiana Dunes and Coastal Plain specimens, show that, just as the leaves tend to occur in whorls but may be solitary, so the flowers tend to be in umbels, but racemose flowers may occur in a cluster whose general nature is umbelliferous. Often, however, whether east or west, the flowers are strictly in umbels. In a few inflorescences all the flowers are racemose, or all the lower flowers may be racemose with the upper two paired. The peduncles, of Indiana specimens at least, are sometimes more or less united (fasciation), making what is in reality an umbel appear somewhat like a pyramidal raceme.

[1] New Manual of Botany, 7th Edition, 1908.

Flower-Size. Considerable variation occurs, depending largely on environmental conditions, or on the number of flowers. Solitary flowers tend to be larger than those which are in clusters. There is no difference in this regard between eastern and western forms.

Peduncles. Ten specimens from Indiana Dunes showed a variation in length from 10–22.5 cm., average 17 cm., longest on 1-flowered plants. Of Coastal Plain specimens, 49 showed a variation from 6–22 cm., average about 13 cm. Farwell gives the length of the peduncles of *L. michiganense* as 10–12 cm.

Curvature of Perianth-Segments. Strongly revolute segments are characteristic of *L. superbum*, and, according to Farwell, of *L. michiganense* also. Deam says that the segments are recurved from near the middle in *L. michiganense*, and from near the base in *L. superbum*. Farwell says that in *L. michiganense* the segments are recurved to below the middle. In Indiana Dunes specimens a study of fresh material shows that curvature starts from the basal portion at about one-third the length of the perianth-segments. This would be nearer the middle than the base. Of 37 Coastal Plain flowers 19 showed about the same curvature as the Indiana specimens, while 18 showed this feature to start much nearer the base. Always the curvature starts below the middle. Age of the flower certainly has something to do with the curvature of the perianth-segments. Newly opened flowers may show for a considerable time no more curvature than is found in *L. canadense*. Always, however, the segments are eventually strongly revolute. This is one of the few characters which remain constant.

Flower-color. *L. superbum* is described in Gray's Manual as orange with dark-purple spots. *L. michiganense*, according to Deam, is orange to reddish-orange outside, and according to Farwell orange-red externally and on the blade internally, the mid-vein being orange-yellow, and the claw pale yellow or whitish, with the numerous spots crimson. In fresh Indiana Dunes material from open places the sepals were orange-red outside, with narrow yellow margin near the base, mid-vein inconspicuous, lighter. The petals outside were like the sepals, but with a wider margin of yellow near the base, mid-vein conspicuous, lighter. Both sepals and petals inside had a base of

green, then were colored yellow with numerous spots for about one-half the length, while the remainder was orange-red. Spots were purple with crimson margin, the heaviest deposit of pigment being in the center. Flowers from shaded places were lighter in color, more nearly orange than red, and the spots were crimson throughout. Coastal Plain specimens were for the most part orange, though a few showed decidedly red, always, however, with a trace of orange. Of these few one is given as an example (DISTRICT OF COLUMBIA, near Washington, July 21, 1878, *Lester F. Ward*). There is no outstanding difference between Indiana Dunes and Coastal Plain flowers, most of the Coastal Plain specimens being colored exactly as Indiana Dunes plants from shaded habitats. Light apparently has something to do with the color-scheme.

ANTHERS. Length, according to Deam, 20–25 mm. in *L. superbum*, 8–12 mm. long in *L. michiganense*. Fresh specimens from Indiana Dunes showed a great variation of from 4–26 mm., average about 16 mm., mostly at anthesis, the longest from large opening buds before anthesis. Coastal plain specimens varied from 11–12 mm., average about 16 mm., the same as the average from the Dunes specimens. The size of the flower has much to do with anther-length, the smallest flowers having as a rule the shortest anthers.

CAPSULES. Indiana Dunes, 25 specimens, showed a variation from oblong (17) to obovate (8). Coastal Plain, 15 specimens, varied from oblong (8) to obovate (7). A single plant may show both forms of capsules, those being the better filled out with seeds having the oblong form.

SEEDS. There is no noticeable difference between the seeds of eastern and western forms.

CONCLUSIONS. Indiana Dunes specimens are quite variable in every character, with three outstanding exceptions, namely, the leaves long-attenuate at both ends, the strongly revolute perianth segments, and the seeds. Coastal Plain specimens, all belonging to typical *L. superbum*, have the same constant characters, otherwise they vary just as do the plants from the Dunes. There is not a single good character which would justify making a new species, or even a new variety, from the old *L. superbum*. Therefore, it is my opinion that *L. michiganense* is

not a valid species, and that all the plants included therein really belong to *L. superbum*.

Indiana material on which this study was based, where collections were possible, has been deposited in the Gray Herbarium.

I wish to express my appreciation to Professor M. L. Fernald, Director of the Gray Herbarium, for the loan of typical specimens of *L. superbum*, and for invaluable advice and suggestions, and to Director Clifford C. Gregg and Dr. Paul C. Standley of the Field Museum of Natural History for affording me excellent facilities for work.

Gary, Indiana

Panicum recognitum in Rhode Island—While botanizing last summer near Diamond Hill in the town of Cumberland, Providence County, Rhode Island, I came upon a *Panicum* that did not seem to fit the description of any species in the manuals, nor could it be matched in the herbarium of the New England Botanical Club. Professor Fernald has examined the specimen and has identified it as *Panicum recognitum* Fernald (Rhodora xl. 331, plates 497 and 498. 1938), and it seems to agree very closely with the description of that species. As this plant was previously known only from southern New Jersey and southern Pennsylvania, its discovery in northern Rhode Island constitutes quite an extension in range and adds an interesting species to the grass flora of New England.

Panicum recognitum is a conspicuous plant on account of its tall growth, some of the culms exceeding a meter in height. It seems to be well distinguished from similar and related species by several characters pointed out in the description. The plants collected in Rhode Island were found in boggy ground along the margins of a brook, growing among other tall herbs and low shrubs. A specimen will be found in the Gray Herbarium under my number 45594, Aug. 24, 1941.—Ernest J. Palmer, Arnold Arboretum.

Pluchea purpurascens (Sw.) DC., var. **succulenta,** var. nov., foliis sessilibus vel breve petiolatis rhomboideo- vel oblongo-ovatis vel obovatis glabris vel glabratis succulentis; capitulis 5.5–9 mm. altis, phyllaribus exterioribus ellipticis vel oblongo-ovatis, sparse pilosis.—Saline, brackish and, sometimes, fresh